

1960

Boeing



DOORS



... **FOR AVIATION**



... **FOR INDUSTRY**

The first Byrne airplane hangar door was constructed in 1928. Shortly thereafter, the same principle of counterbalanced overhead doors was incorporated in the Byrne industrial door. Since that early date, Byrne engineers have constantly designed improvements into both airplane hangar and industrial doors.

In recent years, such outstanding developments as the automatic self-indexing safety stop has been introduced. This safety feature stops the door instantly when its movement is obstructed. Byrne engineers also have been responsible for such innovations as the Byrnaperture, positive drive motor operators, and automatic wheel brakes for large hangar doors.

Typical examples of doors built by Byrne are illustrated in this catalog. Where unusual applications are being considered, Byrne's research and engineering facilities are immediately at your disposal. Your inquiries are invited.

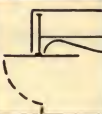
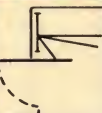
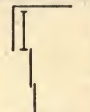
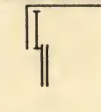
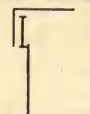
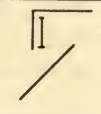
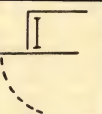
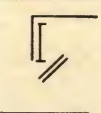
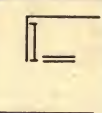
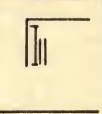
Shown here is a brief compilation of the various types of doors produced by Byrne and the principal features applying to each. In general, all of these doors incorporate standardized engineering and construction details. However, each is custom-built to meet the individual requirements of the particular job and, in many cases, basic designs can be altered to meet special conditions of the structure in which the doors are to be installed.

This chart has been prepared to quickly show in a simple fashion the units which comprise each type of Byrne door, the opening movement, and the dimensional limitations of each. Other pertinent information is also included.

On the following pages are illustrations of actual installations of the various types of doors as well as detail drawings and specifications. Information on special adaptations is available upon request.

physical characteristics

type of door	height	width
unbraced canopy pages 4 & 5	up to 30'-0"	up to 120'-0"
braced canopy pages 4 & 5	up to 55'-0"	any width
telescopic canopy pages 4 & 5	up to 50'-0"	any width
motorized slide pages 6 & 7	any height	any width
crane entrance pages 8 & 9	as required	as required
custom arm guided canopy pages 8 & 9	up to 18'-0"	up to 30'-0"
custom turnover pages 8 & 9	see page 11	see page 11
custom vertical lift pages 8 & 9	see page 11	see page 11

min. headroom	min. jamb space	movement			operation	use
		closed	part.open	open		
2'-1"	2'-3"				door rises vertically 6", then tilts into position with about half projecting outside of hangar forming a canopy.	commercial aircraft; military aircraft; executive and private hangars; large trucking docks.
2'-6"	2'-3"				door rises vertically 6", then tilts into position with about half projecting outside of hangar forming a canopy.	commercial aircraft; military aircraft; hangars and manufacturing plants.
special	special				bottom section moves up to 1/2 opening height. Both sections then tilt to full opening position.	commercial aircraft; military aircraft; hangars and manufacturing plants.
none	width of door leaf + 1'-6"	see pages 6 & 7			doors roll into pockets at either or both jambs.	commercial aircraft; military aircraft; executive and private hangars; large trucking docks.
special	special	see pages 8 & 9			see page 8	see page 8
2'-0"	1'-7"				movement same as unbraced door	truck doors
2'-0"	1'-9"				bottom section rises until even with top leaf, then both sections rise and tilt to horizontal position.	for truck entrance; railroad entrance.
1/2 door opening height + 1'-5" (for 2 leaf)	1'-6"				both sections start moving at same time, bottom section twice as fast as top section.	for truck entrance; railroad entrance.

Byrne

motor operated canopy type

Hangar door openings present problems involving specialized technical skill. To assure a door that is structurally sound, easy and economical in operation, fast-acting, dependable and weather-tight, a competent and experienced manufacturer is the first requisite. Byrne engineers are qualified by 31 years of progressive development with doors of all kinds.

Byrne Canopy Doors are designed to meet any size requirements. They are motor operated, upward acting, suspended by cables which transmit dead loads to compact counterweights. They offer lifetime economies to hangar management by providing:

Swift Operation using minimum operating power.

Snug Weathering permitting reduced initial investment in heating plants and substantial annual fuel savings.

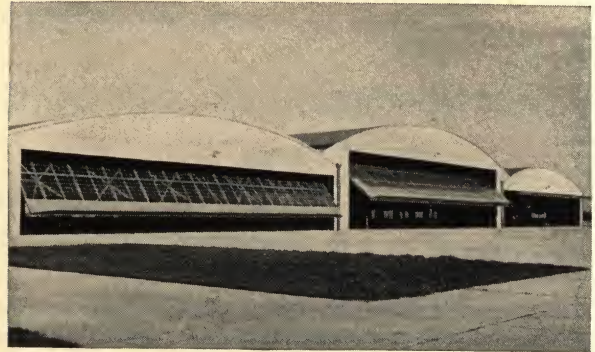
Minimum Maintenance costs which have run less than $\frac{1}{4}$ of 1% per annum over periods of 20 to 25 years.

Space Saving permitting full use of enclosed floor area and forming canopies, which add to the effective working space during mild weather.

Complete Safety of multi-cable, balanced suspension; rigid construction to withstand hurricane wind velocities; automatically self-locking operator mechanisms and overload relays.

unbraced canopy

Byrne Unbraced Canopy Doors are recommended for openings up to 120' wide by 30' high. They are restrained by jamb guides and overhead tracks. Adjacent doors must be separated by fixed columns or mullions.



braced canopy

Byrne Braced Canopy Doors are recommended for heights up to 55'. They may be used in single sections up to 150' wide, or in multiple sections to provide clear openings of any width. Multiple sections may be operated independently or in unison. The doors are restrained by a linkage system which braces the doors directly to the structural framing and transfers wind stresses into the superstructure.



telescopic canopy

Byrne Telescopic Canopy Doors can be made in sections for any width of opening. Sections may be operated independently or simultaneously. The door is divided horizontally into two leaves, the upper leaf is hinged to the supporting steel, the lower leaf is suspended by cables. In operation the lower leaf raises to approximately one-half the opening height, both leaves then tilt outward forming a canopy in the full open position.



operation and controls, unbraced and braced canopy

Operation shall be according to the established Byrne principle, employing multiple-cable suspension and a vertical, tilting motion. The first movement in opening shall be a vertical rise to unlock the lateral bolting system. The door shall then tilt on its own horizontal center and open upward with its lower half projecting outside to form a canopy.

Operator shall be provided with high starting torque, reversible, two-speed motor, solenoid brake, bronze gear and steel worm reduction unit and traction drum. Speed reducer shall be self-locking, of sufficient strength to sustain the specified wind loads. Operator speed shall be at a rate of nine vertical inches of door opening per second. Motor shall be equipped with automatic speed change controls. First movement in opening and final closing shall be at half normal speed. A drum-type master control switch shall be located inside of building near each jamb for each door leaf. Magnetic reversing switch shall have thermal overload relay. Limit switch shall be a positive type, connected with electrical system to stop door at its fully open and closed position. Single speed motors and operation shall be provided for door areas under 1600 sq. ft.

A permanent hand chain operator with clutch lever for each door shall be installed in an accessible position at side wall of building.

telescopic canopy

Operation shall be according to the established Byrne principle, employing multiple-cable suspension.

Vertical lift operator shall be provided with a single speed high torque motor, a worm gear speed reducer, a solenoid brake and traction drum. Tilt operator shall be provided with a high torque motor with built-in brake, a roller chain reduction to a line shaft connecting bevel gear boxes on trunnions that drive the power screws that actuate the tilt arms. The power screws shall be self-locking and of sufficient strength to sustain the specified wind load.

Operator speed shall be at a rate of seven and one-half vertical inches of door opening per second. A drum-type master control switch shall be located inside of building near each jamb for each door leaf. Magnetic reversing switch shall have thermal overload relay. Limit switch shall be a positive type, connected with electrical system to stop door at its fully open and closed positions.

A permanent hand chain operator with clutch lever for each door shall be installed in an accessible position at side wall of building.

specifications

General—The main hangar doors where shown on plans shall be Unbraced, Braced, or Telescopic Canopy (insert type desired) as manufactured by Byrne Doors, Inc., or an approved equal which shall have been in successful use for a period of five years under similar conditions.

Scope of the Work—Complete door leaf and mechanism, including self-locking operator, motor and controls, cables and sheaves shall be provided and installed by the door manufacturer.

Not included in this work are the steel framing and supports, trolley beams, door sill nosing, door jambs, counterweight guides and guards, concrete for counterweights, glass, glazing, field painting and electric wiring to motors and controls. All such work shall be furnished and installed by their respective trades according to the door manufacturer's details.

Door Construction—Door leaf and guide system shall be designed to withstand horizontal wind pressures as follows:

A. For the Braced and Unbraced Canopy Doors, 20 lbs. per sq. ft. in the closed position and 15 lbs. per sq. ft. in a 45° partially open position.

B. For the Telescopic Canopy Door, 15 lbs. per sq. ft. in the closed position and 5 lbs. per sq. ft. in a partially open position.

Sections of convenient sizes for practical handling shall be shop fabricated with suitable field assembly joints. Plate panels shall be 13-gauge flat steel sheets reinforced as necessary with angle stiffeners. Sash panels shall be 1½ in. solid rolled-section fixed steel windows designed for outside putty glazing.

Jambs and head shall be weathered with approved flexible material to fit snugly against contact surfaces.

Sheaves and Cables—Sheaves shall be heavy design, mounted on roller bearings and hardened races and pins. Cable shall be improved plow steel wire-rope of sufficient capacity to sustain the dead weight of the door with 25% impact allowance plus the vertical component of wind, all with a minimum safety factor of five.

Operation and Controls—Insert type desired (Unbraced, Braced or Telescopic Canopy).

guaranty

Each bidder shall state the type of door proposed and the name of manufacturer, and shall submit a list of similar installations and the dates installed. On completion he shall furnish a written guaranty against defective material and workmanship for a period of one year after acceptance.

important note

A large mechanically-operated door involves the work of several trades. The division of responsibility must be clearly defined to insure economy, a complete installation, reliability and long life.

motorized sliding type

specifications

General—The main hangar doors shall be motor operated horizontal-sliding type doors as manufactured by Byrne Doors, Inc., or an approved equal which shall have been in successful use for a period of five years under similar conditions.

Not included in this work are the top guides and supports, bottom rails and ties, cable anchors, glass, glazing, field painting and electric wiring to motors and controls. All such work shall be furnished and installed by their respective trades according to the door manufacturer's details.

Operator System—The operator shall consist of a gear motor with built-in brake, a cone clutch to cushion starting, stopping, and reversing loads, chain reduction and drive sprocket assembly mounted in the lead leaf (or the trailing leaf or on the building, whichever location is most advantageous). The operator shall employ a positive drive which will not be dependent on the traction between door wheel and bottom track. A system of cables shall be used to transmit motion to each leaf at differential speeds so that all leaves arrive at their full open or closed positions simultaneously. The speed of the leading leaf shall not exceed 60 feet per minute.

Transmission Cable—Transmission cable used for moving the leaves shall be improved plow steel running over

cast iron sheaves of a size not less than 24 cable diameters. Sheaves shall be mounted on roller bearings.

Motor—Motor shall be rated for door operator duty, constant torque with integrally mounted magnetic brake. It shall be of sufficient size to operate doors under normal conditions at not more than 75% rated capacity.

Control Switch—The control switch shall consist of a drum reversing type lever and spring return switch at one jamb for each operator.

Control—Control shall consist of positive-acting limit switches. The magnetic starter shall be factory wired and enclosed in a metal cabinet with overload and under-voltage protection. A wiring diagram shall be on the inside of the hinged cover.

Electric Equipment—All electrical equipment and controls shall be furnished by the door manufacturer. The electrical contractor shall furnish and install all wiring and conduits to and between controls and make service connections to motor with unfused safety switch furnished by him near the starter panel.

Emergency Operation—Doors shall be equipped with a means for emergency conversion to tractor towing operation.

(See photos to right—Page 7)

Byrnaperture doors

In the interest of economy, a modern architectural design for hangar doors provides for the housing of the nose and wings of the airplane, with the fuselage and tail remaining on the outside of the hangar. This design has promoted the development of the Byrnaperture, which closes tightly around the fuselage of the plane, keeping drafts and weather from mechanics working inside the hangar. The Byrnaperture is an improvement over the less flexible fuselage closures which heretofore have relied upon canvas curtains.

The Byrnaperture may be operated either mechanically or by electric power, and it provides a snug closure over a wide variety of fuselage contours. The illustrations show an electrically operated aperture which has a range of operation to provide closure for planes from the small Convair fuselage to the large DC-8 fuselage, as well as the large commercial jet planes planned for the future. The specification for the Byrnaperture is as follows:

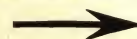
specifications

The hangar doors shall be provided with fuselage apertures similar and equal to the Byrnaperture, as manufactured by Byrne Doors, Inc., Ferndale, Michigan. The location of the apertures shall be as shown on the architect's drawings.

Each aperture shall consist of a series of movable segments which shall fit securely around the fuselages and antennae of a specified range of aircraft. Segments shall be constructed of aluminum and foam rubber gaskets with sufficient flexibility to provide snug, weather-tight closures. Sliding aluminum surfaces shall be provided with nonmetallic anti-friction separators. Byrnaperture segments shall be actuated by electrically operated system of screws and linkages. Each screw and/or linkage to have individual motor operators with an adjustable slip clutch. The control buttons shall have the following stations: constant pressure for closing of segments and momentary pressure for opening. Limit switches shall be provided for the Byrnaperture segments and the closure panel so that the main leaf cannot be operated until the segments and closure panel are in the fully open position.

To close the fuselage opening when not in use, a manually operated slide door shall be provided with suitable locking devices in both the open and closed positions.

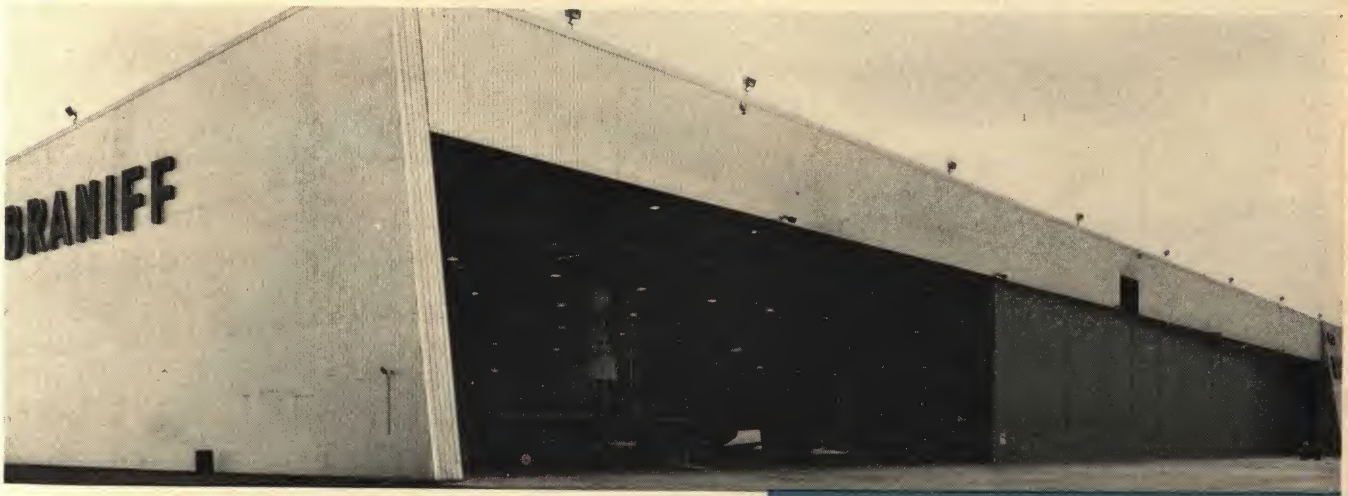
(Continued, with illustrations, next page (7), at immediate right)





*Trans World Airlines
Overhaul Facilities
Mid-Continent International Airport
Kansas City, Missouri*

*Braniff International Airways
Maintenance Base
Love Field,
Dallas, Texas*



*General and Detailed Views of Byrnapertures,
Los Angeles International Airport, Los Angeles, California*

(Specifications continued from preceding page (6), at left)

Both the aperture segments and the sliding closure doors shall be designed to withstand wind loads as specified without exceeding specified deflections or stresses.

When mechanical operation is required, the actuation of the segments shall be provided by a system of hand cranks placed at a location near the floor elevation.



crane entrance doors

Doors for crane entrances are usually one of two different types. One type combines Byrne Unbraced Canopy upward acting doors at the crane rails with swinging or sliding doors below. The upward acting door is always motorized, while the lower doors may be either motorized or manually operated. This is the type door shown in the photographs.

The other principal type uses a single leaf, hinged along the soffit of the building, with the swinging or sliding doors below as mentioned in the paragraph above.

A unique system of cable reeving insures positive opening and closing control.

In both types of these doors, the upward acting and the hinged, the employment of electrical interlocks insures complete safety with automatic or selective controls located as desired. The operating speed of these doors is about 45 ft. per minute. Byrne offers other types of crane entrance doors to suit varying building conditions and crane designs. Engineering consultation, furnished without obligation, is necessary for the successful development of a crane entrance enclosure.

(See photos at right—Page 9)

custom counterweighted doors

custom arm guided canopy

The Byrne Arm Guided Canopy Door can be furnished for openings up to 500 square feet in area. The initial opening movement is a straight vertical rise which overcomes obstruction by ice or snow.

The single section door leaf reduces crackage, with exceptionally tight weathering resulting. The guide plates and linkage arms

which control the operation are compactly designed for minimum projection into the building. Smooth, easy operation is secured by hand chain or motor control.

In the open position the door projects beyond the face of the building forming a canopy which is frequently used to increase the working area.

(See photo at right—Page 9)

custom turnover

The Byrne Custom Turnover Door is recommended for openings up to 25 feet wide by 25 feet high. It requires only two feet of head room above the lintel. In its full open position it projects back into the building slightly more than half of the door opening height.

Smooth, rapid operation makes the Turnover Door ideal equipment where frequent and dependable service is required. Materials

or vehicles may be stored close to the door without interfering with its operation.

Continuous power for Trolley Bus Entrances can be automatically and positively secured with the opening of the door.

A wide latitude of architectural treatment is obtainable by varying the arrangement of the main door members, panels and fenestration in both steel and aluminum construction.

(See photos at right—Page 9)

custom vertical lift

The Byrne Custom Vertical Lift Door can be furnished without limitation in width or height. Depending on the head room available, it is built in one, two, three or four sections.

The basic simplicity of the Vertical Lift Door makes it a first choice whenever clearances permit its installation. Byrne Vertical

Lift Doors are used for railroad entrances, bus terminals, warehouses, piers and a variety of industrial purposes.

The increasing demand for wide unobstructed openings to admit tractor-trailer combinations is successfully met by Byrne Doors which have been furnished for openings up to 80 feet wide.

(See photo at right—Page 9)



general description for custom counterweighted doors

Operation: (Insert type desired.)

Arm Guided Canopy Doors—The first movement in opening shall be a vertical rise. The door shall then tilt on its own horizontal center and open upward with its lower half projecting outside to form a canopy across the doorway. (See diagram this page.)

Turnover Doors—In opening, the bottom section shall raise vertically to a position behind the top section, after which both sections shall act in unison, their tops moving inwardly while their lower edges continue rising until both sections lie in a horizontal position behind the head of the opening. (See diagram page 11.)

Vertical Lift Doors—In opening, all sections shall slide upward simultaneously, the upper section traveling at a fraction of the speed of the second, etc., so that all sections shall arrive at the fully open position, above the lintel and in a vertical position inside the building, at the same time. (See diagram page 11.)

Construction: Stiles and rails shall be constructed of formed plates with all joints welded and ground smooth on outside surfaces. Members shall be so arranged that the sash and plates give the outside of the leaves a paneled effect. No welds, screw heads or other protrusions shall mar the exterior appearance of the sections. All members shall be straight and true and fit together neatly. Welded assembly shall join all parts of the sections securely. Sections shall present a clean and workmanlike finish on both sides.

Vertical guides shall be fabricated from structural steel shapes or plates bolted and welded together to give ample strength at their connections in performing their proper functions. No castings shall be used where tension stresses occur in the door construction.

Material: All frame members, panels, sash, and guides shall be fabricated from structural grade new mill steel. Sheave wheels and rollers shall be grey cast iron. Brackets attaching hardware to leaves shall be formed rolled steel.

Operators (Mechanical): Door shall be operated by continuous hand chains to produce swift, smooth movement of the door sections.

Operators (Motor): Motor operators shall be provided as indicated by the plans and specifications. They shall include motors, limit switches, brakes, reversing panels and three-button control stations. Auxiliary hand chain operators shall be provided.

Integrally mounted limit switches shall stall operation without damage to equipment when doors meet obstructions. One-half cycle of operation shall re-index the limit switches.

Hardware: All rollers and sheaves shall have anti-friction bearings as required to insure smooth, long time operation. Plow-steel wire rope shall have sufficient capacity to sustain the dead weight of the door with 25% impact allowance, with a minimum safety factor of five. Space shall be provided in the design to accommodate steel weights needed to properly balance the door sections.

Shop Finish: Doors, guides and operators shall be given a protective coat of metallic primer before shipment. Hand chain, shafting and moving operator parts shall not be painted.

Erecting and Wiring: Erection of doors, operating equipment and electrical operators shall be done by the door manufacturer, or by an experienced door erecting company. Wiring for the electrical equipment shall be done by the electrical contractor and not by the door manufacturer.

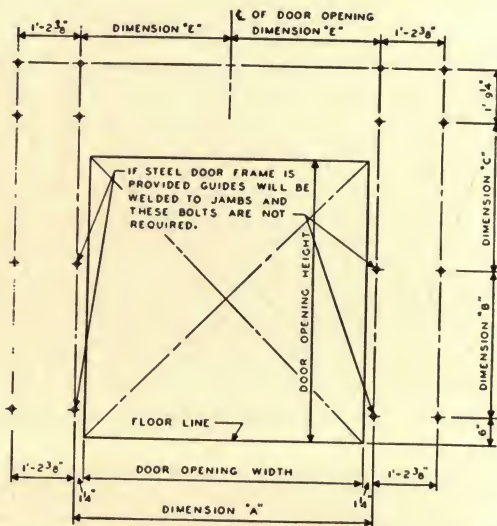
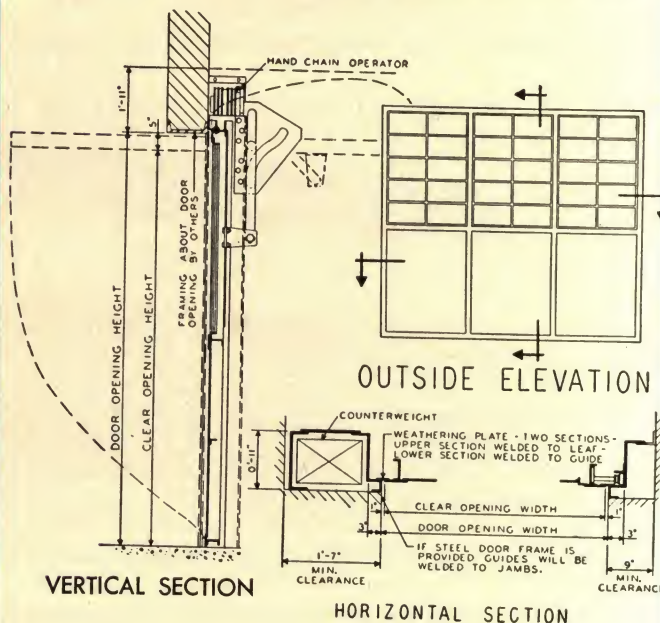
Glazing: Sash shall be outside putty glazed by others, using steel glazing clips. Glass, putty and glazing are not furnished by the door manufacturer.

Note: Anchor bolts to be ½" diameter and embedded securely in masonry or framed into building steel at locations indicated on diagram. Anchor bolts are to project 1¼" from inside face of wall. Anchor bolts to be furnished and set by masonry contractor.

CUSTOM ARM GUIDED CANOPY *

* counterweighted door features

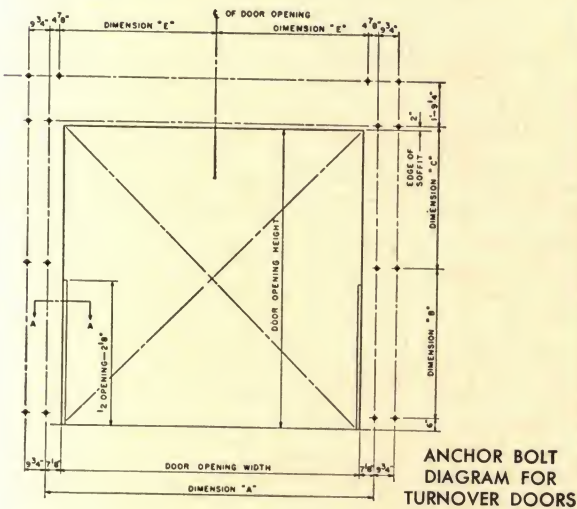
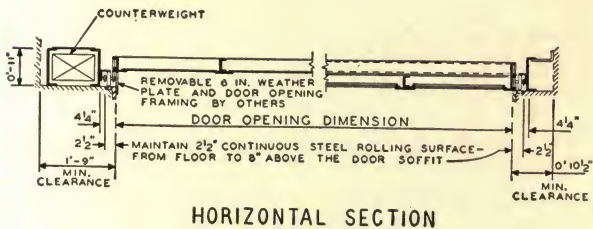
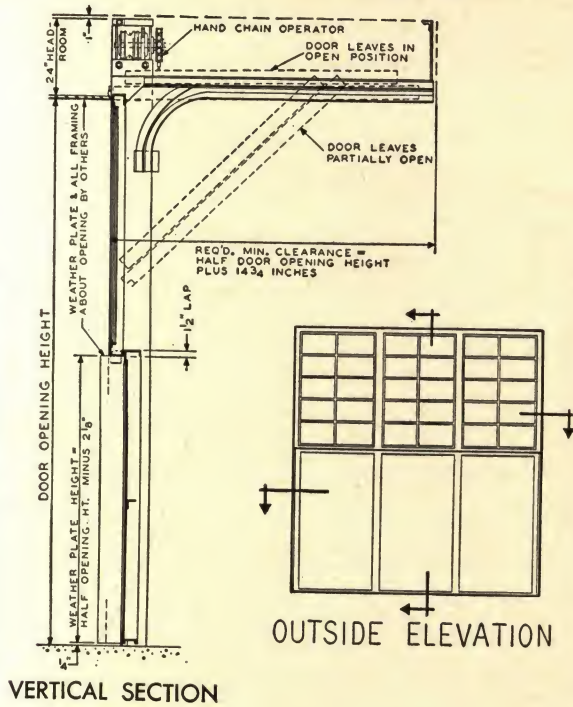
- no springs to weaken, wear out or bind
- heat saving—snugly fitting solid sections
- sturdy—built to withstand any wind pressure
- sash—may be installed as desired
- lower maintenance—all steel, few working parts, no multiplicity of friction joints to bind, rust or corrode.



ANCHOR BOLT DIAGRAM FOR ARM GUIDED CANOPY DOORS

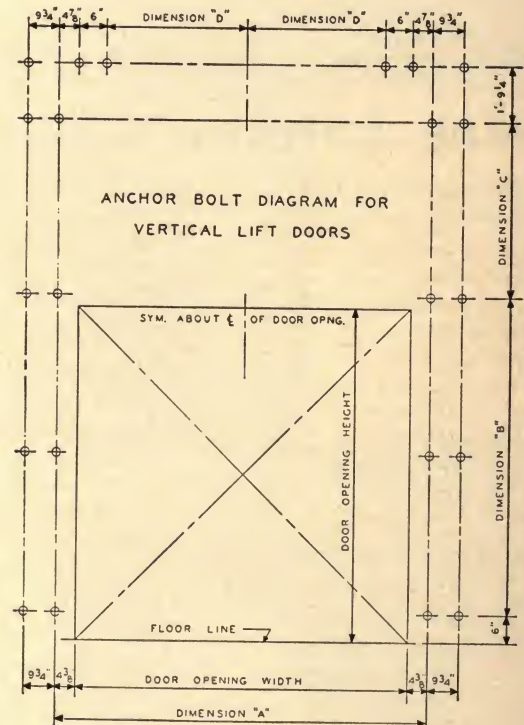
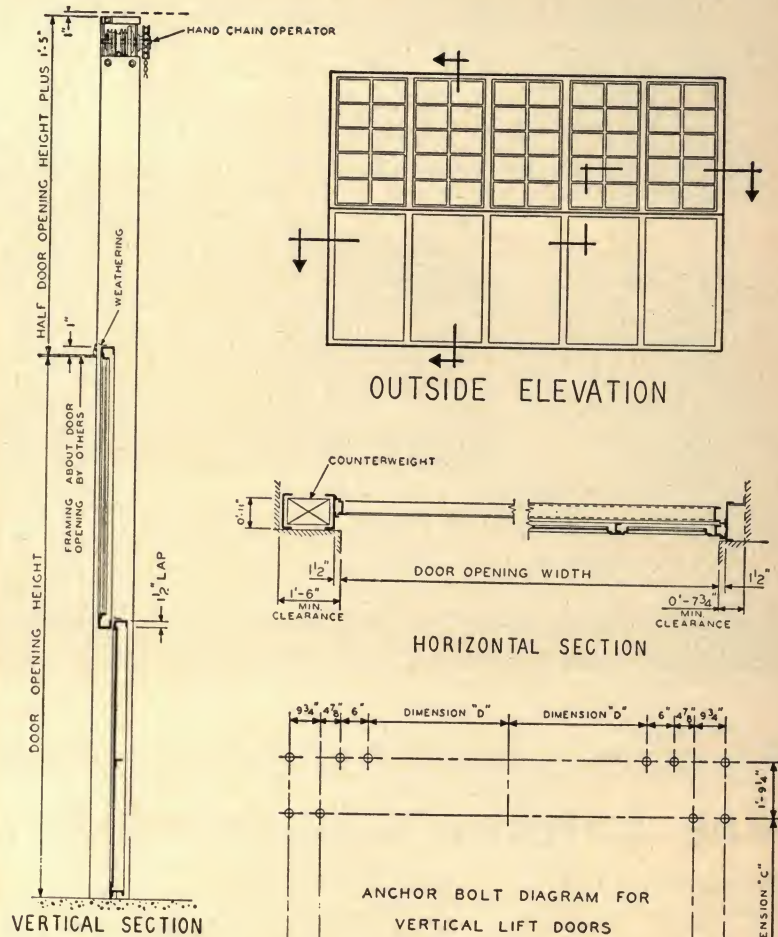
opening width	opening height	"A"	"B"	"C"	"E"
12'-0"	12'-0"	12'-2½"	6'-0"	5'-7"	6'-1¼"
16'-0"	12'-0"	16'-2½"	6'-0"	5'-7"	8'-1¼"
20'-0"	12'-0"	20'-2½"	6'-0"	5'-7"	10'-1¼"
12'-0"	14'-0"	12'-2½"	2 @ 6'-0"	1'-7"	6'-1¼"
16'-0"	14'-0"	16'-2½"	2 @ 6'-0"	1'-7"	8'-1¼"
20'-0"	14'-0"	20'-2½"	2 @ 6'-0"	1'-7"	10'-1¼"

CUSTOM TURNOVER DOORS *



opening width	opening height	"A"	"B"	"C"	"E"
12'-0"	12'-0"	13'-2 1/4"	1 @ 6'-0"	5'-8"	6'-2 1/4"
16'-0"	12'-0"	17'-2 1/4"	1 @ 6'-0"	5'-8"	8'-2 1/4"
20'-0"	12'-0"	21'-2 1/4"	1 @ 6'-0"	5'-8"	10'-2 1/4"
12'-0"	14'-0"	13'-2 1/4"	2 @ 6'-0"	1'-8"	6'-2 1/4"
16'-0"	14'-0"	17'-2 1/4"	2 @ 6'-0"	1'-8"	8'-2 1/4"
20'-0"	14'-0"	21'-2 1/4"	2 @ 6'-0"	1'-8"	10'-2 1/4"
17'-0"	22'-0"	18'-2 1/4"	3 @ 6'-0"	3'-8"	8'-8 1/4"

CUSTOM VERTICAL LIFT *



opening width	opening height	"A"	"B"	"C"	"D"
12'-0"	12'-0"	12'-8 3/4"	2 @ 6'-0"	5'-1"	5'-5 1/2"
16'-0"	12'-0"	16'-8 3/4"	2 @ 6'-0"	5'-1"	7'-5 1/2"
20'-0"	12'-0"	20'-8 3/4"	2 @ 6'-0"	5'-1"	9'-5 1/2"
12'-0"	14'-0"	12'-8 3/4"	3 @ 6'-0"	2'-1"	5'-5 1/2"
16'-0"	14'-0"	16'-8 3/4"	3 @ 6'-0"	2'-1"	7'-5 1/2"
20'-0"	14'-0"	20'-8 3/4"	3 @ 6'-0"	2'-1"	9'-5 1/2"
17'-0"	22'-0"	17'-8 3/4"	5 @ 6'-0"	2'-1"	7'-11 1/2"

Byrne



TRANS WORLD AIRLINES INC. • PHILADELPHIA, PA.

A few satisfied customers who use **Byrne** DOORS

BYRNE AIRPLANE HANGAR DOORS and BYRNE INDUSTRIAL DOORS

HANGAR DOORS FOR COMMERCIAL AIR LINES

American Airlines, Inc.
Braniff Airways, Inc.
Capital Airlines, Inc.
Continental Air Lines, Inc.
Delta Air Lines, Inc.
Eastern Air Lines, Inc.
National Airlines, Inc.
Northwest Airlines, Inc.
Trans World Airlines, Inc.
United Air Lines, Inc.
Western Air Lines, Inc.

HANGAR DOORS FOR AIRCRAFT MANUFACTURERS

Aero Design & Engineering Co.
Chance Vought Aircraft Inc.
Convair, A Division of General Dynamics Corporation
Curtiss-Wright Corporation
Douglas Aircraft Co., Inc.
Fairchild Engine & Airplane Corp.
Goodyear Aircraft Corporation
Kaman Aircraft Corporation
Lockhead Aircraft Corporation

*Martin Co., Glenn L.
*North American Aviation, Inc.
*Republic Aviation Corporation
*Sikorsky Aircraft Division
*Thieblot Aircraft Co.
*United Aircraft Corporation

HANGAR DOORS FOR OTHER AVIATION USERS

*Buick Motor Division
Civil Aeronautics Administration
Dow Chemical Company
*Hamilton Standard Division
*General Electric Company
*National Advisory Committee for Aeronautics
Ohio Oil Company
*Port of New York Authority
Pratt & Whitney Aircraft Division
Sperry Gyroscope Co.
Studebaker-Packard Corp.
*United Gas Pipe Line Company
*U. S. Air Force
*U. S. Dept. of Public Works
*U. S. Marine Corps
*U. S. Navy

INDUSTRIAL DOOR USERS

*AC Spark Plug Division
*American Bridge Company
American Car & Foundry Company
*American Metal Products Company
American Radiator & Standard Sanitary Corp.
*Anaconda Copper Mining Company
*Atomic Energy Commission
Bath Iron Works
*Bethlehem Steel Co.
*Blaw-Knox Construction Company
*Bucyrus-Erie Company
*The Budd Company
Canada Dry Ginger Ale, Inc.
*Caterpillar Tractor Company
Central Hudson Gas & Electric Corp.
*Chevrolet Motor Division
*Chrysler Corporation
*Detroit Edison Company
*Detroit Street Railways
*Detroit Tank Arsenal
*Eastman Kodak Company
Eaton Manufacturing Co.
*Electro-Motive Division
*Erie Mining Company

Firestone Tire & Rubber Company
*Fisher Body Division
*Ford Motor Company
Ideal Cement Company
International Business Machines Co.
International Harvester Company
Jersey Central Power & Light Co.
*Jones & Laughlin Steel Corp.
Kimberly-Clark Corporation
Missouri-Pacific Lines
National Cash Register Company
*New England Power Company
Omaha Street Railway
Pittsburgh-Des Moines Steel Co.
*Pontiac Motor Division
Portland Cement Association
Rockland Power & Light Company
Rotary Electric Steel Company
*Schlitz Brewing Company
*Ternstedt Division
*Tide Water Associated Oil Co.
Union Carbide & Carbon Corp.
*United States Rubber Company
*U. S. Steel Corporation
Wagner Electric Company
Youngstown Sheet & Tube Company

*Indicates Repeat Customer of 2 or more jobs

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